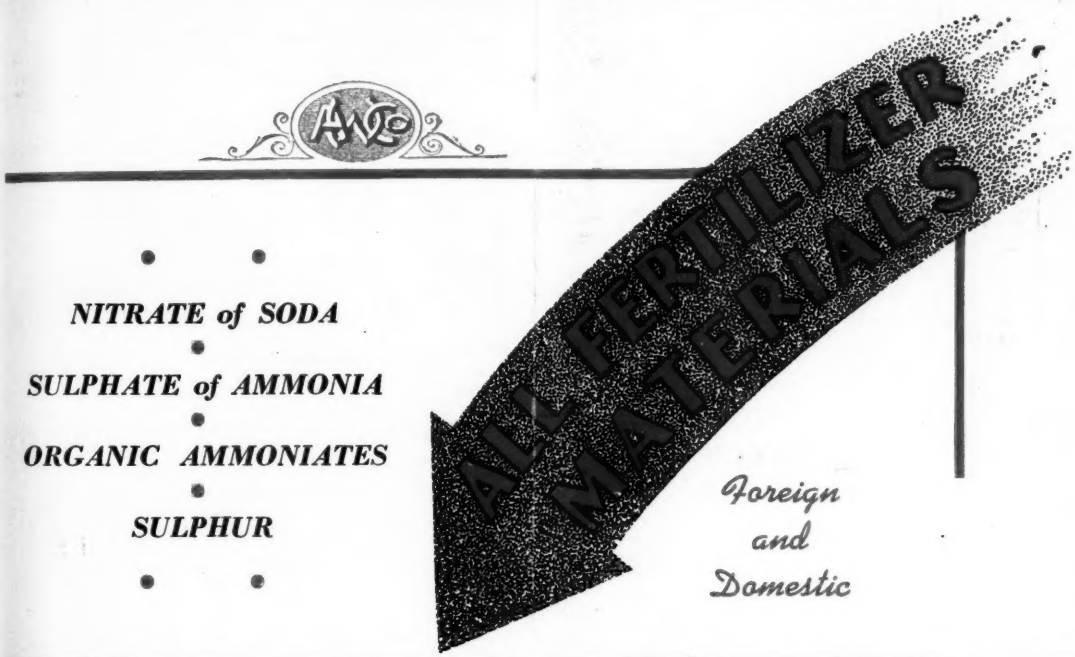
The American Fertilizer

Vol. 98 APRIL 24, 1943 No. 9



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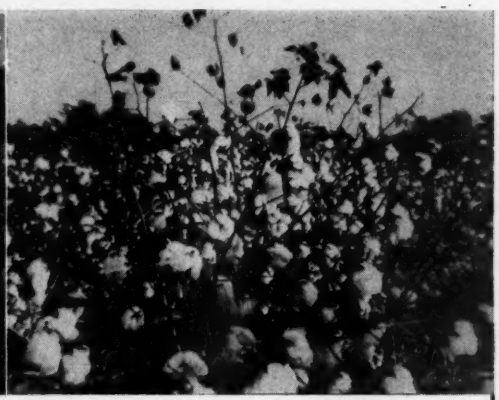

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See page 23

...THE...

AMERICAN FERTILIZER

"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

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Main Potato Fertilizer—Rotation Studies

Summary of Bulletin 414, Maine Agricultural Experiment Station, Orono, Maine.

MOST of the experimental work on potato fertilization in Aroostook County, Maine, has been, and still is being, conducted in cooperation with farmers throughout the potato-producing area. These cooperative studies have been fruitful in yielding worth-while results concerning the plant-nutrient value of new fertilizer materials, rate of fertilizer application, fertilizer placement, high-analysis fertilizer, magnesium deficiency, and other fertilizer problems affecting potato production. Owing to the necessity of having to locate these cooperative experiments on a different field each year to conform with the rotation practiced, no opportunity was afforded to study the effect on yield of growing potatoes year after year on the same land in comparison with potatoes grown in rotation. Questions concerning the residual effects of fertilizer treatment on the soil were left unanswered. Experimental work was needed to determine the relative importance of the major plant nutrient elements—nitrogen, phosphorus, and potassium; the need for the so-called minor elements in high-analysis fertilizers; and other problems requiring a more permanent arrangement than was afforded by the cooperative experiments with farmers.

Accordingly, several series of permanent soil fertility plots were established on Aroostook Farm on Caribou loam, the principal soil type in Aroostook County. Some of the plots were arranged in a two-year rotation, some in a three-year, others on a non-rotation basis. Throughout the fifteen-year period that the experimental studies have been under way, the Green Mountain variety of potatoes was used in these experiments.

The experimental studies reported in this bulletin were started in 1927 and extend over a fifteen-year period, 1927 to 1941. However, owing to certain changes in fertilizer treatment in 1930, some of the results are presented for two periods, one for 1927 to 1929, inclusive, and the other for 1930 to 1941, inclusive.

The data derived from the experimental studies on the permanent soil fertility plots are summarized as follows:

(1) The effect of rotation on potato yields was studied. Three rotation series were used, namely, a three-year rotation of oats–clover–potatoes, a two-year rotation of green-manure crop-potatoes, and a non-rotation or continuous cropping with potatoes. The use of 2000 pounds per acre of a 4–8–7 fertilizer per crop of potatoes resulted in 383, 404, and 351 bushels per acre, respectively, for the three-year, two-year, and the continuous cropping series as an average for the last twelve years.

(2) The importance of adding organic matter in addition to chemical fertilizers was demonstrated. On the two-year rotation series the average yield of potatoes over a thirteen-year period was 370 bushels where the green-manure crop was cut and removed, 410 bushels where the green-manure crop was plowed under, 437 bushels where six tons per acre of straw were plowed under in addition to the green-manure crop, and 456 bushels where twenty tons per acre of manure were plowed under in addition to the green-manure crop. A similar addition of manure on the continuous cropping series raised the potato yield from 351 to 454 bushels per acre.

(3) Fertilizer is necessary for the production of high yields of potatoes. During the last twelve years the plots which received no fertilizer produced only an average of 123 bushels per acre while the plots which received 2000 pounds per acre of 4–8–7 fertilizer produced an average of 381 bushels per acre, a difference of 258 bushels. Increasing amounts of fertilizer (1500, 2000, 2500, and 3000 pounds per acre of 4–8–7) used, resulted in progressively larger yields of potatoes.

(4) The effect of varying amounts of nitrogen, phosphoric acid, and potash in potato fertilizers was studied over a period of fifteen years. As compared with the yield produced by a 4–8–7 standard mixture, during the last twelve years leaving out nitrogen reduced the yield by 84 bushels, leaving out phosphoric acid reduced the yield by 103 bushels, and leaving out potash reduced the yield by 248 bushels. Increasing the amounts of nitrogen, phosphoric acid, and potash over the amounts contained in a 4–8–7 mixture resulted in a small increase in yield from additional nitrogen, no increase from additional phosphoric acid, and a rather large increase from additional potash. These data and some unpublished data suggest that potato fertilizers in Aroostook County should supply per acre approximately 100 pounds each of nitrogen and phosphoric acid and about 200 pounds of potash. Such amounts of plant nutrients might be expected to produce in the neighborhood of 400 bushels of potatoes per acre under normal weather conditions. Larger amounts of plant nutrients might be utilized and result in larger yields under better than average conditions of soil, weather, and farm management.

(5) The effect of fertilizer treatment on percentage of U. S. No. 1 grade is compared with yield data for the same fertilizer treatments and indicates a rather good correlation between yield and per cent U. S. No. 1 grade. Those fertilizer treatments which produced low yields also produced a low percentage of large sized potatoes. This is especially true of the 4–8–0 and the no-fertilizer treatments and to a lesser degree of the 0–8–7, 4–0–7, and the 1500-pound application of a 4–8–7.

(6) Several materials were used as single sources of nitrogen and as partial sources of nitrogen in potato fertilizers. In general the fertilizer mixtures which contained nitrogen derived from two or more nitrogen materials produced higher yields than did the fertilizers with only one source of nitrogen.

(7) The influence of rainfall and temperature on potato yields shows that potato yields tend to increase with increasing rainfall and to decrease with increasing temperatures. July and August appear to be the so-called "critical" months for the potato crop in Aroostook County. Lower than normal rainfall during these months coupled with high temperatures resulted in low potato yields.

(8) Potassium chloride and potassium sulphate were compared as sources of potash in potato fertilizers. Both proved to be equally effective in the amounts used in so far as yields are concerned. Analytical studies of tubers indicate that the potatoes produced with fertilizers containing the potassium sulphate source of potash possessed a higher starch and a higher total dry matter content than did the potatoes produced with fertilizers containing potassium chloride as a source of potash.

(9) Several high-analysis fertilizers were compared with ordinary-strength fertilizers in two- and three-year rotations. Some of the better high-analysis mixtures produced yields which compared favorably with yields produced by the standard 4–8–7 mixtures.

(10) Minor-element studies were started in 1936 to determine how long potatoes can be grown on Caribou loam without the addition of the so-called minor elements to potato fertilizers. To accentuate the depletion of the supplies of such elements occurring naturally in the soil, relatively pure mixtures of urea, monoammonium phosphate, and potassium nitrate were used to supply the nitrogen, phosphoric acid, and potash. Thus far only magnesium deficiency has been observed on the plots receiving these pure salt mixtures. Potato yields obtained with these pure salt mixtures thus far have been only slightly lower than with comparable amounts of nutrients from regular fertilizers.

(11) Studies comparing acid and neutral fertilizers were started in 1938. Thus far the acid fertilizers have produced as high yields as the same mixtures rendered neutral by the addition of either high-calcium or dolomitic limestone.

(12) Yield data are presented for the oats, clover, and green-manure crops used in the two- and three-year rotations. The yield data for these subsidiary crops are grouped to show the residual effect of the fertilizer treatments used on potatoes. No fertilizer was applied directly to any of these crops.

Fertilizing Canning Crops in 1943*

Fertilizer Formulas That Can Be Obtained This Season and How to Use Them Most Effectively

By CHARLES B. SAYRE, Geneva, N. Y.

THE limitations on the use of fertilizers and the urgent need for increased production of vegetable canning crops focus attention on the kinds of fertilizers that can be obtained this year and methods of using them most effectively. This year there are restrictions on the number of kinds of fertilizers that can be manufactured and sold, as well as restrictions in regard to the crops that some fertilizers can be used for and on the amount of fertilizer that may be applied per acre for each crop. These regulations are set forth in detail in Food Production Order No. 5 of the United States Department of Agriculture. Briefly, the purpose of the government restrictions on fertilizers is to regulate the sale and use of fertilizers so that every grower will have an opportunity to purchase an adequate amount of the right kind of fertilizers for producing the food crops most needed.

The object of this article is three-fold, *viz.*, (1) to inform growers of these fertilizer restrictions; (2) to discuss briefly the fertilizer recommendations for vegetable canning crops in accordance with the 1943 regulations; and (3) to describe more effective methods of applying fertilizers.

On account of the need for nitrogen in the manufacture of munitions, the amount of nitrogen alloted for fertilizers is approximately 20 per cent less than was used last year. Consequently, the use of fertilizers containing nitrogen has been restricted and mixed fertilizers cannot contain over 4 per cent nitrogen. This has resulted in several new fertilizer formulas not previously recommended. Furthermore, the Food Production Administration of the United States Department of Agriculture has limited to 16 the number of analyses of mixed fertilizers, only nine of which contain nitrogen, that may be offered for sale in New York State this year. This is in striking contrast to the situation in former years. For example, last year about 125 different fertilizer analyses were sold in New York, notwithstanding the fact that the fertilizer specialists in the Departments of Agronomy, Floriculture, Pomology, and Vegetable Crops at Cornell and at the Experiment Station at Geneva, as well as leading representatives of the fertilizer industry, agreed that a total of 20 approved analyses of mixed fertilizers would adequately meet the requirements of general farmers and of fruit and vegetable growers on *all* types of soil in this great State.

The exigencies of war, therefore, brought about a very desirable reduction in the unnecessary multitude of fertilizer analyses. This is an important factor in keeping down the costs of fertilizer because the fewer kinds of fertilizer require much less storage capacity for both manufacturers and retailers.

Disadvantages of Restrictions

There are two disadvantages in the present restricted list of approved fertilizers. First, no high analysis mixed fertilizers are obtainable; and second, the ratio of nitrogen is lower than might be desirable for many vegetable crops. Nitrogen in the form of sulphate of ammonia and nitrate of soda, however, can be obtained for side dressing vegetables, though the amount is restricted.

High analysis fertilizers are not obtainable because to make them manufacturers have to use either ammo-phos or treble superphosphate, each of which contains 48 per cent phosphoric acid. The Canadian government is taking all of the ammo-phos, and the limited amount of treble superphosphate produced in this country is being used for shipment to our overseas possessions such as Hawaii. Space in cargo boats is so very valuable that the most concentrated fertilizers should rightly be assigned for this use. Consequently, those growers who had formerly used a double-strength fertilizer will find it necessary this year to use a larger amount of a lower analysis mixture in order to obtain the same total amount of plant nutrients. For example, 1,000 pounds of 4–10–5 will supply the same amount of phosphorus and potash as 500 pounds of 10–20–10, but there will be 20 per cent less nitrogen in the approved grade. At the same time there is likely to be more of the

(Continued on page 22)

*From "Farm Research" published by the New York Agricultural Experiment Station, Geneva, N. Y.

Regulation to Stop Job Transfers

Pursuant to Executive Order 9328 the chairman of the War Manpower Commission has issued Regulation No. 4 to stop transfers to jobs at higher wages unless the shift is in the interest of the war program.

Under the regulation:

(1) Any employer engaged in an essential activity may hire for work in such activity any new employee who for the preceding 30 days was not engaged in an essential activity. (WWC states that "any worker may make such a change even if an increase in wages is involved.")

(2) No employer shall hire for work in an activity other than an essential activity any new employee who, during the preceding 30-day period, was engaged in an essential activity if the wage or salary rate to be paid by the employer would exceed the rate most recently earned by such employee.

(3) No employer shall hire (except as indicated in [4] below) for work in an essential activity any new employee who, during the preceding 30-day period, was engaged in an essential activity if the salary or wage rate to be paid by the employer would exceed the rate most recently received during such period by the employee.

(4) Any employer engaged in an essential activity may hire for work in such activity any new employee who, during the preceding 30-day period, was engaged in an essential activity, without regard to his preceding wage rate or salary scale, providing such hiring is subject to, and permitted under, an employment stabilization program approved by the War Manpower Commission.

(5) A "new employee" is any person who has not been in the employ of the hiring employer at any time during the preceding 30-day period.

(6) The acceptance of new employment by a worker is prohibited in any case where the employer is prohibited from hiring the worker.

(7) "Essential activity" includes any activity in the WMC List of Essential Activities. The List includes, among other activities, the production of fertilizers.

(8) Penalties attach to employers and employees for violations of the regulation.

(9) The regulation is not to be construed to prejudice existing rights of an employee under any agreement with his employer.

Fertilizer Grade Conferences

Shreveport

The grade conference at Shreveport, April 17th, was attended by industry representatives and by agricultural workers from Louisiana, Texas, Arkansas, and Oklahoma. In the absence of Commissioner Harry D. Wilson of Louisiana, Charles J. Brand presided. Wm. F. Watkins emphasized the need for distributing fertilizers to get the largest quantities of crops that are most needed and to make the supply meet the demand as nearly as possible. In general, somewhat more consideration should be given to crop requirements, with less emphasis on historic usuage, but changes in this direction will not be severe.

Mr. Brand discussed the fertilizer supply situation and outlook, calling on Dr. H. B. Mann for a statement on potash. The best figures available indicate that next year's supplies of phosphate and potash fertilizers will be equal to or slightly greater than this year's. The nitrogen supply may be equal to this year's, but uncertainties make it impossible to predict just how much or what forms will be available for fertilizer use.

Recommendations as to grades to be sold next year were made for Arkansas by Dr. R. P. Bartholomew, for Texas by Dr. G. S. Fraps, for Oklahoma by Dr. H. J. Harper, and for Louisiana by Dr. A. P. Kerr and Dr. M. B. Sturgis. The grades for each State were discussed and voted on, one by one, by the industry; and the following lists were adopted for recommendation to the Food Production Administration:

Arkansas: 0–12–12, 0–14–7, 0–10–20, 3–9–18, 3–12–6, 4–8–12, and 4–12–4.

Louisiana: 0–12–4, 0–12–12, 0–14–7, 3–12–6, 3–12–12, 4–8–12, 4–10–7, 4–12–4, and 12–8–0 (for sugar cane only).

Texas: 0–14–7, 3–12–6, 4–8–12, 4–10–7, and 4–12–4 for general use: 3–10–0 for rice; 6–12–0 and 10–10–0 for the Rio Grande Valley; and 6–30–0, 10–20–0, and 12–15–0 for the Panhandle and west Texas.

Oklahoma: 0–14–7, 2–12–6, 3–12–6, 4–12–0, and 4–12–4.

California

The District 12 grade conferences at Los Angeles, April 20th, and Berkeley, April 22nd, were well attended both by the industry and by agricultural workers—more than 125 in all. At each meeting Wm. F. Watkins spoke on FPO 5, answering many questions;

(Continued on page 20)

Further Changes in Fertilizer Order

Amendment 4 to FPO5 Releases More Organic Nitrogen and Permits Additional Fertilizer Distribution.

THE War Food Administration has taken steps to relieve the pressure on the use of organic nitrogen materials in mixed fertilizers, and to facilitate distribution of additional fertilizer needed in production of essential war crops.

These changes, effective April 24th, are provided in amendments to Food Production Order 5, which governs the distribution of fertilizer:

(1) The requirement in Schedule II that 3 per cent nitrogen grades in Group (3) contain a minimum of one unit of organic nitrogen, has been removed for the States of Georgia, Kentucky, Maryland, North Carolina, South Carolina, Tennessee, and Virginia.

(2) If dealers and agents do not have on hand the ordinary analysis grade which a farmer is eligible to obtain, they may deliver to the farmer, from stocks on hand, other grades of a different nitrogen content, provided the farmer receives the equivalent quantity of nitrogen per acre that he would have obtained from the prescribed grade.

Illustration: A dealer or agent in North Carolina has a customer authorized to receive 400 pounds of 3–9–6 for application per acre on a certain crop. The dealer or agent is unable to deliver the 3–9–6 but has some 4–10–6 which he had on hand on April 24. He may deliver to the customer 300 pounds of the 4–10–6 for application per acre, since the total nitrogen content thereof—12 pounds—does not exceed the total nitrogen content of 400 pounds of 3–9–6.

(3) Dealers and agents are permitted to deliver, from stocks on hand on April 24, the special 4–9–3 tobacco plant-bed grade, for use on any Group A or Group B crop.

(4) Fertilizer manufacturers, dealers and agents are authorized to deliver chemical nitrogen fertilizer for starter solutions for vegetable crops in 25- and 50-pound packages instead of the minimum 80-pound packages previously required.

(5) The War Food Administration is authorized to establish maximum rates of application per acre for the grade approved to be used on specified crops in each State.

Removal of the mandatory organic nitrogen content of certain 3 per cent nitrogen grades was made possible by an easing in the supply of chemical nitrogen available for immediate use. This move should tend to ease the organic nitrogen situation which is critically tight in many sections of the country, WFA officials said.

Food Production Order 5 requires, under certain conditions, that a nitrogen grade used in the base period be replaced in 1943 by a grade carrying a lower nitrogen content. As the season nears the close, some dealers and agents have approved grades in stock which do not fit in the replacement pattern in some cases. To free these stocks for use this season, permission is granted dealers and agents to deliver them to farmers for use at an equivalent rate per acre based on the nitrogen content of the approved grade otherwise authorized to be delivered. Similarly, the special 4–9–3 grade which was ear-marked for tobacco plant beds only is released for delivery from stocks remaining at this time in dealers' and agents' hands for use on any Group A or Group B crop.

In authorizing that fertilizer for starter solutions be packaged in smaller containers, WFA officials pointed out that the 80-pound package contains a greater quantity than is generally required by many vegetable growers.

Purpose of the measure authorizing WFA to establish maximum rates for application is to provide an overall control and to make possible without delay any modification upward or downward which is in line with changes in fertilizer supplies and sound farming practices.

Other provisions authorize a 3–8–5 grade for Texas, and a 10–10–5 and a 10–12–10 grade for Idaho.

Group A crops include castor beans, long staple varieties of cotton, flax, guayule, hemp, hybrid corn for seed production, peanuts, soybeans, green beans, dried beans, lima beans, beets, cabbage, carrots, kale, onions, peas, peppers, potatoes, spinach, sweet corn, tomatoes, vegetable seeds, tung, and certain

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Earthworms Play Jack Straws

Have you noticed straws or leaf petioles sticking upright in the lawn? "Earthworms playing jack straws" is the explanation Dr. L. C. Curtis of the Connecticut Experiment Station, New Haven, gives for the phenomenon.

Well, it's not exactly that, Dr. Curtis goes on to explain, but earthworms are responsible for the unusual position of the straws, twigs or fallen petioles, and even leaves, bits of paper, feathers and pebbles. These terrestrial animals use the "jack straws" to stop up their burrows. Occasionally the softer parts of plant material serve as food. Emerging at night, the worms drag the material part way into their hideouts, presumably to prevent the entrance of water during heavy rains, or it may be to conceal their burrows from marauders or to keep out the cold air at night.

The earthworm is man's friend, not only as fish bait but also as a soil conditioner. Considering its size, a worm swallows an enormous quantity of earth while excavating its burrow and consuming soft bits of vegetative matter in the soil. Lacking teeth and jaws, it cannot bite off leaves or shoots of living plants, but exists for the most part on semi-decayed material. Its digestive system, like that of a chicken, includes a crop and gizzard, the better to masticate its food.

Examination at the Experiment Station shows that the castings which are deposited on the soil surface contain plant food elements in greater quantity and in a far more available form than that of the surrounding soil. Nitrate nitrogen in castings is almost five times more abundant than in the top six inches of soil. Available phosphate is seven times greater; available potash, 11 times; and available magnesium, three times. Humus is about 40 per cent greater than in topsoil. Someone has figured that one earthworm will produce about eight pounds of castings in a single season. Wise gardeners, therefore, will encourage the multiplication of earthworms in the soil. The addition of an organic mulch to the top of the soil is the best way to do this.

Charles Darwin in his 60-year-old classic, entitled "The Formation of Vegetable Mould Through the Activity of Worms, With Observations on Their Habits," pointed out the earthworm's value to agriculture: "The plough is one of the most ancient and most valuable of man's inventions; but long before he existed, the land was in fact regularly ploughed, and still continues to be thus ploughed, by earthworms. It may be doubted whether

there are many other animals which have played so important a part in the history of the world, as have these lowly organized creatures.

"Worms prepare the ground in an excellent manner for the growth of fibrous-rooted plants and for seedlings of all kinds," he further explains. "They periodically expose the mould to the air, and sift it so that no stones larger than the particles which they can swallow are left in it. They mingle the whole intimately together, like a gardener who prepares fine soil for his choicest plants. In this state it is well fitted to retain moisture and to absorb all soluble substances, as well as for the process of nitrification."

Ballen of Peru Awarded Potts Medal by Franklin Institute

In recognition of his leadership in the scientific restoration of a valuable natural resource to his country, The Franklin Institute, long known for its ranking position in the world of science, this year bestowed upon Don Francisco Ballen, of Lima, Peru, a highly coveted Howard N. Potts Medal. The award was made at their annual Medal Day exercises on Wednesday, April 21st.

The rebuilding of the guano industry during the last thirty-odd years by the National Guano Administration of Peru, under the direction of Senor Ballen, is a remarkable story of the regeneration of a dead industry by the application of careful scientific research in biological and industrial fields.

The Peruvians have used guano as fertilizer since the days of the Incas. Its nigrogen content is calculated to be 30 times as effective as normal manure, and this may apply to the phosphorus content as well. Thus, its value proved by the results of long usage, its application spread to Europe and the United States, to which it was exported in tremendous quantities.

Soon the large reserve of this valuable fertilizer had shrunk to the extent that export practically ceased. By 1875, the industry was ruined, bird life having been almost destroyed by ruthless methods of mining the deposits, and Peru herself needed all the guano she could get. By 1900 Peru realized that she had suffered a severe financial loss by the curtailment of her export, and that steps would have to be taken to rebuild what had so recklessly been wasted.

The National Guano Administration was formed for that purpose, and Senor Ballen, its leader, immersed his staff into a long and careful study of bird life and oceanography of that district, of the cyclic fluctuation of the ocean currents, the supply of fish and the rapid drop in the number of birds. They had to develop, too, methods of mining which would not interfere with the birds' nesting, and to encourage the increase of bird life as much as possible.

As a result of Don Francisco Ballen's research and experiments he evolved a table apportioning definite quantities of guano to be mined each year, on a seventeen-year basis, so that in no year would the depletion be so great as to cause a shortage of the desposit. His success was remarkable, for whereas in 1914 he had built up the yield to an average of only 50,916 metric tons, by 1938, the industry had been stepped up to the high yield of 170,000 tons.

This achievement, the culmination of years of labor, study and research, has been an inspiration to all who seek the means of restoring to industry the use of natural resources, and countries throughout the world have benefited by his glorious performance.

Obituary

WILLIAM N. McILRAVY

William N. McIlravy, former Chairman of the Board of the Barrett Company, now the Barrett Division of Allied Chemical and Dye Corporation, died in Reno, Nevada, on April 21st. He was 73 years of age.

Born in Griggsville, N. Y., Mr. McIlravy came to New York City while a young man and in 1892 became associated with the Barrett Company. In 1918 he was elected Chairman of the Board of that company.

During his active years, Mr. McIlravy took an active part in the affairs of the fertilizer industry. A regular attendant at the meetings of the National Fertilizer Association, he made many close friends throughout the industry who will deeply feel his passing. He is survived by Mrs. McIlravy and two daughters, Mrs. R. M. Logan, of Piedmont, Cal., and Mrs. Marian M. Stead, of Reno, Nev.

April Meeting of Fertilizer Industry Committee

The Fertilizer Industry Advisory Committee met at Washington on April 14th, David Meeker, U.S.D.A., presiding. Present also: D. W. Aitken, W. E. Lafkin, Don Parel, F. W. Parker, L. G. Porter, W. F. Watkins, U.S.D.A.; Dale C. Kieffer, H. H. Meyers, Edmund Rowland, WPB; J. C. Freeman, C. G. Gran, Paul L. Poirot, OPA; Capt. B. A. Grovmeier, John T. Monteith, Maj. John A. Walker, War Department; H. M. Albright, George Cushman, M. K. Derrick, R. B. Douglass (for O. F. Smith), N. E. Harman, S. B. Haskell, M. H. McCord (for C. F. Hockley), John L. Morris (for Wm. B. Tilghman), O. J. Noer, J. E. Sanford, C. D. Shallenberger, H. V. B. Smith, R. A. Waite (for M. H. Lockwood), F. J. Woods, J. A. Woods, members of the Committee; Charles J. Brand, D. S. Murph, N.F.A.

The operation of Food Production Order 5 was discussed. Officials pointed out that an order intended to have the effect of law must be in legal language, and that amendments and directives become necessary from time to time to meet conditions and situations that arise.

With respect to nitrogen, officials stated that because of uncertainty as to supplies for next year and as to military demands, a conservation policy is necessary. The nitrogen available for agriculture must be used primarily for the production of food. Assurance was given that everything possible is being done to assure supplies. Consideration is being given to the withdrawal of organic nitrogen from non-essential uses and diversion of it to food and military needs. This might be done by applying to it the same restrictions now applicable to the use of chemical nitrogen under FPO 5 and otherwise directing its use.

The subcommittee on organic nitrogen reported that the situation indicates that some form of supervision of distribution will probably be necessary for the coming season, but they wish to get some further information before making a final report; that, as an interim report, they recommend that the appropriate Government agency direct producers of organic nigrogen materials to make no sales or commitments for the coming season, this not to interfere with sales for current crop needs. Organic nitrogen should be used only for essential purposes. Military needs should be taken into consideration in formulating a program, and effort should be made to satisfy at once the Army's most urgent need for immediate use.

Army officials pointed out damage to motors and loss of life resulting from dust on airfields. It is desirable that airfields be constructed on soils which contribute to quick drainage, and to grow grass on such sandy soils there is need for considerable organic nitrogen. Moreover, the best results are obtained from planting grass at this season. It was suggested that a conference of nitrogen producers, U.S.D.A., WPB, and Army representatives, and Government counsel be held to try to make arrangements for supplying the Army's immediate needs.

OPA officials invited comments on Amendment 140 to Supplementary Regulation 14 to the General Maximum Price Regulation (bulk superphosphate). No suggestion for any change was made.

It was stated that agronomists have been working on tentative lists of grades for next season. The agronomists were advised that the nitrogen situation apparently would be more favorable next year, and these lists were prepared with reference to efficient crop production rather than with reference to supplies of materials, it being the plan to turn over the

(Continued on page 16)

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FERTILIZER MATERIALS MARKET

NEW YORK

Concentrated Superphosphate Moving in Larger Quantity into Domestic Channels. Potash Company Renews Old Price for Coming Year. Shipments of Sulphate of Ammonia on Contracts.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, April 20, 1943.

High-test superphosphate is now moving, with considerable quantities going into Maine for use in potato fertilizers. This movement of high-test superphosphate will undoubtedly aid in the manufacture of mixed fertilizers tremendously. Most of the buyers are especially interested in figuring on what quantities of this material they will be able to get in subsequent months but this is dependent almost entirely on the action of the government. It is hoped that, if certain quantities are allocated for shipment against Lend-Lease, at least a fair supply will be retained in this country for use by the domestic mixers.

Potash

One of the larger potash companies has issued its price list for the new season, showing no change against last year's schedule. If labor shortage does not interfere to too great an extent, it is expected that the potash production for the new year will be larger than in the past and domestic needs should be fairly well taken care of. With supervision of the government, it is hoped that the potash will be shipped where needed and evenly distributed to fill all reasonable requirements.

Sulphate of Ammonia

Allocations have been granted for the total estimated output of sulphate of ammonia for April and deliveries are being made regularly against contract. There has been some delay in completing certain contracts due to material having been allocated for export, but it is expected that all old contracts will be fairly well completed, certainly by the middle of May.

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BALTIMORE

Labor Shortage May Hinder Fertilizer Shipments. No Resale Materials on the Market. Ceiling Prices on Superphosphate.

Exclusive Correspondence to "The American Fertilizer"

BALTIMORE, April 20, 1943.

During the past two weeks the outstanding features in connection with the fertilizer industry have been shortage of labor and transportation equipment. During the past week or so, the weather has been unseasonably cool, but with the approach of warmer weather, the demand will probably be keener, and manufacturers will be up against it to get out the goods. There is no question but that they will be able to sell everything they will be able to ship.

Ammoniates.—The market on organic ammoniates continues tight, and in fact the demand for feeding purposes has been so heavy there is practically nothing left in the way of organics for fertilizer manufacturers. The ceiling for feed is considerably higher than for fertilizer, and manufacturers will have to arrange to substitute other materials, which are almost as scarce.

Nitrogenous Material.—The market is bare of offerings with nothing in sight at the present time.

Sulphate of Ammonia.—While allocations have been increased recently, the tonnage available for fertilizer purposes is far below manufacturers' requirements. This is one season when there have been no re-sale offerings on the market at all.

Nitrate of Soda.—The same remarks apply to this commodity as to sulphate of ammonia. More nitrate, however, is being used in mixtures than heretofore.

Potash.—One of the producers has just announced new schedule of prices for another season on practically the same basis as last year. The demand is in excess of production, and this condition will probably continue, due

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to mixtures containing less ammonia being increased in potash content.

Superphosphate.—Ceiling prices on this commodity have now been issued on the basis of 64 cents per unit of A. P. A. in bulk, f.o.b. Baltimore, with minimum content of 18 per cent. This represents only a proportionate increase in price as compared to the increased cost of manufacture, due to higher cost of rock on account of advance in fuel oil at rock mines.

Bone Meal.—The market is practically bare of offerings, but inquiries are now few and far between.

Bags.—No change in the situation, as practically all manufacturers have provided for their requirements for the present season, and in a majority of cases will ship in paper bags until the market on burlap reaches more nearly normal proportions.

CHARLESTON

Potash Prices Show No Change. More Chemical Nitrogen Allocated to Fertilizer Manufacturers. Organics Extremely Scarce.

Exclusive Correspondence to "The American Fertilizer"

CHARLESTON, April 19, 1943.

One of the producers of potash has brought out his price schedule, which is practically the same as that of the past season; for instance, 53½ cents per unit for muriate of potash, 60 per cent K_2O, ex-vessel Atlantic or Gulf ports.

Nitrogenous.—There is still none of this material being offered, but there are more chemical products such as nitrate of soda, urea compound, and cyanamid being allowed to the manufacturers.

Castor Meal.—No change in this situation as the demand still is greater than the production.

Dried Blood.—This material is quoted at $5.38 per unit ammonia ($6.54 per unit N) unground. Feeders are still not completely supplied.

Cotton Meal.—Prices are still merely nominal, the 8 per cent grade being quoted at $38.60, Atlanta. Soya meal is priced at $45.75.

PHILADELPHIA

Unseasonable Weather Causes Bottleneck in Shipments and Manufacturing Schedules. Scant Supply of All Materials.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, April 19, 1943.

The very unseasonable weather being experienced here in the Middle Atlantic States has retarded activities for farmers and mixers. Farmers have been understandably slow in withdrawing mixed goods, with the result that mixers find themselves with warehouses stocked full. Consequently, some manufacturers are requesting postponement of shipments of raw materials until the position eases a little. Otherwise the market situation is just a repetition of previous reports—heavy demand and scant supply of all raw materials.

Ammoniates.—With the exception of some lower-analysis materials, there are very little or no ammoniates to be had.

Sulphate of Ammonia.—The easing of allocations of this material is helping to alleviate the scarcity of nitrogen for the fertilizer industry.

Nitrate of Soda.—The allocations on this are easier, as for the sulphate of ammonia.

Superphosphate.—Production is moving out to users at sustained pace.

Bone Meals.—No relief in sight for this material, for it is still extremely scarce.

Potash.—For the "second period," applications by users must be submitted to WPB by May 1.

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CHICAGO

Trading in Fertilizer Organics Restricted. Futures not Being Quoted. Feed Demand Exceeds Available Supply.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, April 19, 1943.

Conditions are unchanged in the organic market, and ceiling prices are maintained. Buying interest is still excellent, but supplies are short, and trading, therefore, is restricted. Apparently no organic material will be available for this season, and sellers have not as yet decided to quote futures.

Feed producers are unable to supply the demand, and are allocating their output as equitably as possible.

Ceiling prices on all fertilizer and feed materials are unchanged.

No change in ceiling prices: High grade ground fertilizer tankage, $3.85 to $4.00 ($4.68 to $4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, $5.53 per unit ammonia ($6.72 per unit N); blood, $5.38 ($6.54 per unit N); dry rendered tankage, $1.21 per unit of protein, Chicago basis.

APRIL MEETING OF FERTILIZER INDUSTRY COMMITTEE

(Continued from page 12)

lists to WPB and U.S.D.A. for determination and action as might be desirable or necessary in view of supplies of materials and the crop production program. After considerable discussion numerous members of the Committee expressed the opinion that higher nitrogen grades should not be approved until there is greater certainty as to the nitrogen situation, and that in the meantime in general the present grade lists should not be changed otherwise than by reduction in the number of grades. It was stated that the Food Production Administration would prepare a grade list and submit it to the Committee at the May meeting, members of the Committee being invited to submit their suggestions to FPA in the meantime. It was also stated that U.S.D.A. would write the agronomists advising them that there is no present certainty that there will be increased supplies of nitrogen for next year.

The superphosphate subcommittee reported orally that apparently adequate supplies of phosphate rock would be available. Labor and grinding capacity are factors in the whole situation. The new rating of AA-1 under CMP for maintenance, repair, and operating supplies, applicable to acidulators and dry mixers, toward which N.F.A. and interested Government agencies have been working, should be of substantial assistance in keeping the machinery in operation. Probably the most important factor in maintaining the desired increase in production is the acceleration of the movement of superphosphate from the plants during June, July, and August, so as to make the most efficient use of storage and transportation facilities. This in turn would mean that farmers must accept earlier delivery of mixed fertilizer. It was understood that the subcommittee, following the discussion, would prepare a written report to be sent to the industry.

WPB officials discussed the operation of Order M-291, allocation of potash. It was stated that the basis of allocation to each fertilizer manufacturer will be, in the main, the manufacturer's takings of potash during 1940–41 and 1941–42, with appropriate adjustments to take care of requirements in areas specified by the Food Production Administration.

The next meeting will be held on May 12th.

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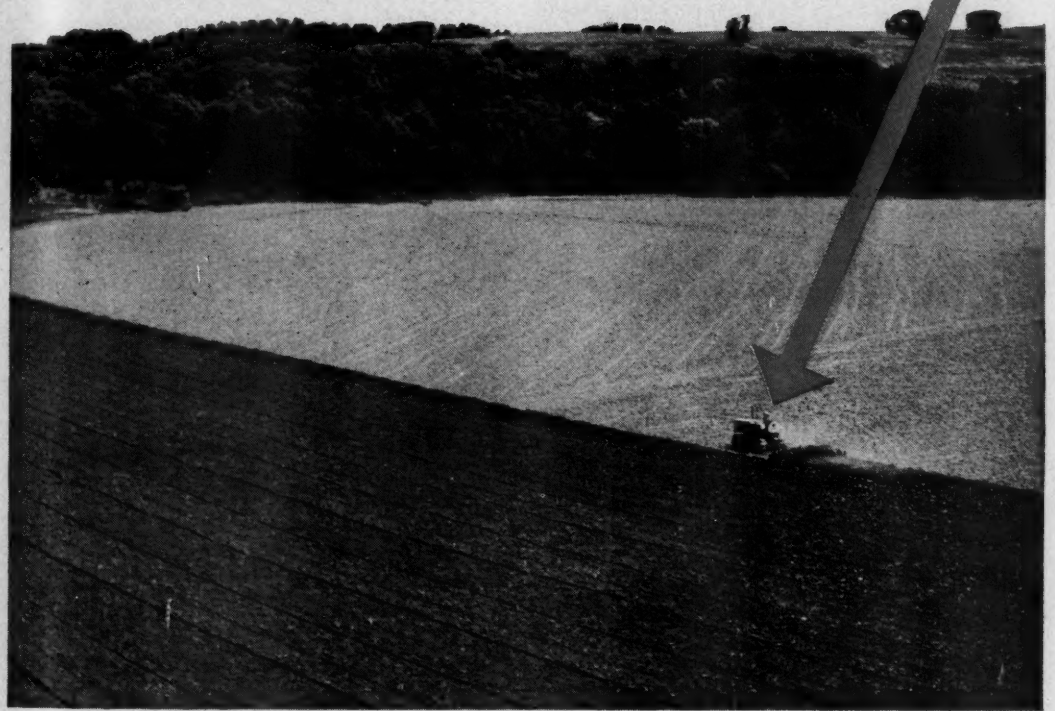

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Fertilizer Rationing for Puerto Rico

The rationing of chemical fertilizer in Puerto Rico was put into effect on April 24th by the Secretary of Agriculture (Food Production Order No. 10) so that an adequate amount of the limited supplies will be made available for the Island's food production program and so that all farmers will receive equitable shares.

The limitations on shipping to Puerto Rico have not only greatly reduced the supplies of fertilizer available for the Island but also have required the greatest possible expansion in the production of foodstuffs for local consumption. While fertilizer has not been used on food crops to any great extent in the past, it is necessary that sufficient supplies be made available at this time to insure the success of the food production program.

The order directs the U. S. D. A. War Board for Puerto Rico, which will admini ter the rationing program, to reserve not less than 10,000 tons of the fertilizer on hand for food crops. Department officials say that this amount will be sufficient for the period ending June 30th of this year, to meet the needs of Puerto Rico's food production program.

The remaining amount of fertilizer will be rationed to producers of sugar cane on the basis of their past use of fertilizer for this crop. While the available supplies for distribution to sugar cane growers will be substantially less than the amounts formerly used for this crop, it is believed that the contemplated rationed amount will be adequate to produce a crop of reasonable size for harvest in 1944.

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Which Phosphate Has Greatest Relative Value For The Farmer?

A Digest of a Recent Investigation* at the Alabama Experiment Station.

By VINCENT SAUCHELLI

Agronomist, The Davison Chemical Corporation

HOW is the ordinary farmer to decide which phosphate of commerce has the greatest relative value for his purposes? He cannot possibly investigate their relative merits on his farm because in most cases he has neither the competency nor the time to conduct the necessary field tests. Listening to the claims of the salesmen or reading the descriptive folders for each kind merely serves to bewilder him. The fancy trade names confuse him. Fortunately, there is one agency in his community on which he can depend—the state agricultural experiment station. Below are given the results of one of these stations which serves to guide the farmers in its community to evaluate properly the several kinds of phosphate offered as plantfood.

Because of the many claims made by the sponsors of waste pond phosphate†—so-called colloidal phosphate—the Department of Agronomy and Soils, of the Alabama Experiment Station undertook to evaluate this material as a source of fertilizer phosphorus in comparison with rock phosphate and regular superphosphate. Greenhouse pot experiments and field tests were carefully conducted to standard experimental procedures. Hairy vetch and orange sorghum were grown as the indicator crops. The soils used ranged from typical clays, clay loam, fine sandy loam to very fine sandy loam. The P_2O_5 content of the phosphates was: superphosphate, 17.46 per cent P_2O_5; Tennessee brown rock phosphate 33.09 per cent P_2O_5;,

* "Waste pond phosphate compared with rock phosphate and superphosphate as a fertilizer."—G. W. Volk, *Journ. Amer. Soc. Agronomy*, Vol. 34, No. 9, Sept. 1942.

† Waste pond phosphate also carries the following trade names: Colloidal Phosphates, Phos Cal Oids, Mineral Colloids, Cal-Phos, Collosphos, Vitaloid Phosphate, Lonfosco, and Colimephos.

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No. 1 waste pond phosphate, 20.92 per cent P_2O_5; No. 2 waste pond phosphate, 23.0 per cent P_2O_5.

In the first series of greenhouse experiments comparing the phosphates on an equivalent P_2O_5 basis (96 pounds of P_2O_5 per acre), the results were.

With hairy vetch as the crop, superphosphate gave increased yields of from 2 to 18 times greater than the increases from the rock phosphate or both brands of waste pond phosphate.

With sorghum as the crop, superphosphate increased the yields from 2 to 23 times more than the increased yields from the other phosphates.

Next the phosphates were compared on a basis of 48 to 384 pounds of P_2O_5 per acre. The results in all cases proved the superiority of superphosphate to increase crop yields.

On Hartsells soils (very fine sandy loam) superphosphate applied at rates of from 48 to 192 pounds of P_2O_5 per acre produced from 47 to 323 per cent more sorghum; and from 180 to 1000 per cent more sorghum on the Cecil soil (clay) than did the rock or both brands of waste pond phosphate.

Similar increases were obtained when hairy vetch was used as the crop; with 96 pounds of P_2O_5 as superphosphate the increased yields of vetch were 59 per cent more than from 384 pounds of P_2O_5 as waste pond phosphate. The yields of vetch from waste pond phosphate averaged a little lower than those from rock phosphate and were less than half of those from superphosphate.

The Station carried out field tests at several of the agricultural substations and experimental fields in the state using various crops and for a period of 10 years. The results of these tests confirm the relative superiority of superphosphate.

With cotton as a crop, superphosphate increased the yields about 2 to 4 times, and with winter legumes, from 2 to 6 times more than did waste pond phosphate. Even on soils relatively high in available phosphorus and hence slow to respond to phosphorus fertilization on which corn was the crop, the superphosphate increased the yields by about 2 to 3 bushels per acre over the other phosphates.

The author observed that the same general results were obtained from all tests in greenhouse and field experiments; and further, that wherever the soil was of a type which responded well to phosphorus fertilization the superphosphate gave invariably higher yields than either rock or waste pond phosphate.

These results from Alabama confirm the published results from Texas where Dr. G. S. Fraps of the Texas Agricultural Experiment Station showed that the availability of the phosphoric acid in waste pond and rock phosphates was significantly lower than in superphosphate. Investigators at many other experiment stations have similarly shown that, generally speaking, the ability of the phosphorus in superphosphate to increase crop yields is considerably greater than that in rock and waste pond phosphates.

FERTILIZER GRADE CONFERENCES

(Continued from page 8)

Charles J. Brand discussed the supply situation and outlook; H. R. Smalley spoke on new developments in research and in fertilizer use; and "The Life of the Soil" was shown.

G. C. Dunford, District 12 chairman, and Byron Reynolds, president of the California Fertilizer Association, presided at Los Angeles, and Weller Noble at Berkeley. Wallace MacFarlane, chairman of the committee on grades, reported at Los Angeles, and Mr. Noble handled the discussion at Berkeley. No grades were added to the list in effect now, but five were dropped. Those now recommended are: 0–10–12, 2–10–8, 4–6–8, 4–10–10, 4–12–4, 4–18–18, 5–12–5, 5–14–9, 6–10–4, 6–9–6, 6–12–8, 8–8–4, 8–6–8, 8–0–12, 8–10–12, 10–10–5, 10–10–0, 10–5–10, 10–5–5, 10–16–8, 10–20–10, 10–12–10, 12–0–14, 12–6–0, 14–0–8, and 17–7–0.

Mr. Brand spoke at both meetings on his recent trip to South America, illustrating his talk with colored pictures.

Dr. Antonio Arena, chief, Division of Soils, Ministry of Agriculture, Argentina, gave a brief description of the agriculture of that country at the Los Angeles meeting.

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FERTILIZING CANNING CROPS IN 1943

(Continued from page 7)

desirable minor elements in the lower analysis mixture which is an advantage.

The Food Production Administration has grouped all crops into two classes, A and B.

TABLE
Fertilizer Recommendations for Canning Crops, for 1943

Fertilizer Recommended*	Pounds Per Acre: Optimum for most conditions	Pounds Per Acre: Optimum for exceptional conditions	Soil Type
Beans, Snap, Canning			
4–10–10	400	600	Sandy soils†
4–10–5, 4–12–4, 4–16–4	400	600	Loam and silt loam
Beets, Carrots, and Other Root Crops			
4–10–10	1,000	2,000	Sandy soils†
4–10–5	1,000	2,000	Loam and silt loams
3–12–15	1,500	2,000	Recently cleared muck
4–8–12	1,500	2,000	Muck cultivated 10 years or more
Cabbage			
4–10–10	1,500	2,000	Sandy soils†
4–10–5, 4–12–4, 4–16–4	1,000	1,500	Loam and silt loam
Peas, Canning			
4–10–10	600	1,000	Sandy siols
4–12–4, 4–16–4	600	1,000	Loam and silt loam
Spinach			
4–10–10	1,000	1,500	Sandy soils†
4–10–5	1,000	1,500	Loam and silt loam
3–12–15	750	1,250	Recently cleared muck
4–8–12	1,000	1,500	Muck cleared 10 years or more
Sweet Corn, Canning			
4–12–4, 4–16–4	400	500	Loam and silt loam
Tomatoes, Canning			
4–12–4, 4–16–4	1,200	1,600	Loam and silt loam
4–10–10	1,200	1,600	Sandy soils

*On loam soils, particularly those of western New York which are known to be deficient in phosphorus, the 4–16–4 analysis is recommended. This analysis is also recommended for loam soils when vegetables are grown in rotation with general farm crops and when stable manure is used.

†Since the nitrogen content of mixed fertilizers is relatively low, a side-dressing with 150 to 200 pounds per acre of nitrate of soda, or its equivalent, is recommended on these crops. In addition, a side-dressing may be needed for crops other than these for which it is recommended in the table, particularly on light soils in seasons of heavy rainfall.

The A class includes food crops most essential for winning the war and are to be given preference in the use of fertilizer. All vegetable canning crops are in class A. A grower may purchase and use fertilizers for these crops up to the amounts recommended by the state experiment stations. These official recommendations have been prepared by the Departments of Agronomy, Pomology, and Vegetable Crops at Cornell University and are given in table.

Growers of canning crops will find these regulations and recommendations well suited to their needs this year. Examination of the table shows that the fertilizer recommendations have been greatly simplified in regard to grades recommended. If a grower has a loam or silt loam soil, such as Ontario loam, Honeoye loam, or Dunkirk silt, which are the most common types of soil in the principal canning crops growing regions of this State, a 4–16–4 or a 4–12–4 fertilizer is recommended for six of the seven crops listed. If a grower has a sandy soil, a 4–10–10 fertilizer is recommended for each of these crops. This should result in economy in handling.

All fertilizer dealers in New York State have been supplied with these recommendations. But before any dealer can sell a fertilizer containing nitrogen, except Victory Garden 3–8–7, he must obtain from the grower a written statement containing the following information: (1) Rate and grade of fertilizer used in 1941 or 1942 on the crops grown and the acreage fertilized; (2) total fertilizer requirements for this year by crops, acreage, and fertilizer grade; and (3) the amount of fertilizer the grower has on hand or on order from other fertilizer dealers. The dealer can then fill orders for fertilizers up to the quantities recommended for each crop. These recommendations are liberal and have been carefully chosen to meet the needs for large crops.

(Continued on page 26)

FLORIDA PEBBLE PHOSPHATE ROCK

PHOSPHATES FOR A VICTORY CROP

This year, more than ever before, American farmers need phosphates to grow bigger, better crops to feed America and her allies. Phosphate fertilizers are particularly important in "high vitality" war-crop production. With our background of 38 years in producing phosphate rock we are well prepared to meet wartime needs of the fertilizer industry for this essential plant food source. Because our experience includes the mining and preparation of all grades of Florida phosphate rock we are in a position to render valuable service to fertilizer manufacturers.

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THREE ELEPHANT

. . . . WHEN BORON IS NEEDED TO CORRECT A DEFICIENCY OF THIS IMPORTANT SECONDARY ELEMENT

Agricultural authorities have shown that a lack of Boron in the soil can result in deficiency diseases which seriously impair the yield and quality of crops.

When Boron deficiencies are found, follow the recommendations of local County Agents or State Experiment Stations.

Information and references available on request.

AMERICAN POTASH & CHEMICAL CORPORATION

122 East 42nd ST., NEW YORK CITY

Pioneer Producers of Muriate of Potash in America

See Page 4

FURTHER CHANGES IN FERTILIZER ORDER
(Continued from page 9)

fruits for drying. Most other crops are classed in Group B.

The wording of the amendment is as follows:

Amendment 4 to Food Production Order 5

Part 1206—Fertilizer

CHEMICAL FERTILIZER

Section 1206.1 is hereby amended as set forth below:

Paragraph (c) (1) (v) is amended to read as follows:

(v) Deliveries by fertilizer manufacturers, dealers, or agents of chemical fertilizer containing chemical nitrogen for the preparation of starter solutions to be used in the transplanting of vegetable crop plants, or to the use by any person of any chemical fertilizer delivered pursuant to this paragraph (c) (1) (v) for such purpose. Notwithstanding any provision in this order to the contrary, fertilizer authorized to be delivered by this paragraph (c) (1) (v) may be packaged in packages of 25 or 50 pounds net weight.

Paragraph (e) is amended to read as follows:

(e) *Substitution of grades.* Set forth in Schedule II attached hereto is a list of the grades (stated on a nitrogen content basis or on a crop basis) of chemical fertilizer used in each of the States designated on such schedule during the 1940–1941 season (July1, 1940–June 30, 1941) and a list of the approved grades for each of such States for the 1942–1943 season (July 1, 1942–June 30, 1943). The 1940–1941 grades and the 1942–1943 grades are listed in groups—each group being identified by a group number. The grades listed in a particular 1942–1943 group are the grades approved for substitution during 1942–1943 for the grades of the 1940–1941 group bearing the corresponding group number. Where a grade in one of the 1940–1941 groups was used on a particular crop during the 1940–1941 season, no grade other than a grade appearing in the corresponding 1942–1943 group shall be used on such crop during the 1942–1943 season, except as otherwise provided in this paragraph (e). For example, where a person used a grade carrying 2 per cent nitrogen on a particular crop in Connecticut during the 1940–1941 season, he shall not use any grade other than a 0–14–14, 0–20–20, or 0–9–27 grade on such crop during the 1942–1943 season. Notwithstanding any other provision of this paragraph (e), grades containing four or less per cent nitrogen manufactured, delivered and used in 1940–1941 on crops described as vegetable crops in Schedule III may be replaced by approved grades containing the same percentage of nitrogen as the grade replaced. This paragraph (e) shall not prevent the delivery and use in the 1942–1943 season, at the election of the user, of a grade having a nitrogen content lower than that authorized for use in such 1942–1943 season. Nor shall this paragraph (e) prevent the delivery and use in the 1942–1943 season of a multiple-strength grade of chemical fertilizer instead of an ordinary analysis grade of chemical fertilizer, provided that the nitrogen content of the multiple-strength grade shall not exceed the nitrogen content of the ordinary analysis grade on a per acre application basis. This paragraph (e) shall not prevent the delivery and use in the 1942–1943 season of any ordinary analysis grade of chemical fertilizer in the hands of a dealer or agent on April 24, 1943, instead of a grade otherwise authorized to be delivered by this paragraph (e), provided that the nitrogen content of the grade delivered shall not exceed the nitrogen content of the grade otherwise authorized to be delivered on a per acre application basis. In the event that information covering use in the 1940–1941 season is not available, use in the 1942–1943 season may be based on grades used in 1941–1942.

Paragraph (i) (3) is redesignated as paragraph (i) (4).

Paragraph (i) is amended by adding the following new paragraph to be designated as paragraph (i) (3):

(3) Notwithstanding the provisions of paragraphs (i) (1) and (i) (2) hereof, the Director may fix the maximum rate of application per acre for the approved grade (straight or mixed) to be used on any Group A or Group B crop.

The following changes have been made in

Fertilizer Machinery *AND* Acidulating Equipment

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Bags

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KEYSER BUILDING

the approved lists of grades in Schedule I: (a) The restriction that the following grades be used "for tobacco plant beds only" has been removed: Georgia, 4–9–3; Maryland and District of Columbia, 6–6–8; North Carolina, 4–9–3; South Carolina, 4–9–3; Virginia, 4–9–3. (b) Idaho: The grades 10–10–5 and 10–12–10 have been added. (c) Texas: The grade 3–8–5 has been added.

FERTILIZING CANNING CROPS IN 1933

(Continued from page 22)

Effective Use of Fertilizers

Although a small amount, up to 300 pounds per acre, of fertilizer applied in bands close to the plant is very effective, large amounts applied in the same manner might prove injurious due to the excessive concentration of soluble salts. For example, for crops such as corn or cabbage grown in rows 3 feet apart or for crops such as tomatoes grown in rows 5 feet apart, when the fertilizer is applied in bands close to the row, the concentration of soluble salts in the fertilizer band is increased 18 and 30 times, respectively, as compared with broadcast application of the same amount of fertilizer. If the fertilizer contains much nitrogen or potash, the concentration of soluble salts may be so great that it will extract water from the roots and cause the severe injury or death of plants commonly known as "fertilizer burning." Moderate amounts of fertilizer applied in bands will not cause this injury but will be very effective in stimulating rapid early growth so important in producing large yields.

Repeated tests at Geneva and elsewhere around the State have shown that large amounts of fertilizer may be applied with profit to vegetable canning crops. With the higher prices for all canning crops this year and the urgent need for increased production growers will probably want to apply the maximum amount recommended or permitted this year. For beets, carrots, cabbage, spinach, and tomatoes this would mean 1,000 pounds or more of fertilizer per acre. To apply such quantities in bands close to the row would likely prove injurious. There are three methods of applying large amounts of fertilizer to produce large yields without danger of "fertilizer burning."

Applying Large Amounts of Fertilizer

A very effective method of using a large amount of fertilizer would be to broadcast and plow under the bulk of it and then apply about 300 pounds with an attachment to the drill or transplanting machine that will deposit the fertilizer about 2 inches to the side of the row and about 4 inches deep. This method, however, requires special fertilizer attachments and unless a grower already has this equipment he probably can not get it this year.

Another effective method is to apply the fertilizer in a band in the bottom of each furrow. This can be done very easily with an attachment to the plow that deposits the fertilizer directly behind the plow. This will result in a series of bands at plow depth and 14 or 16 inches apart. This method is especially effective in a dry season, but also requires special equipment which is obtainable in only limited quantities this year.

Another very effective method that does not require any special equipment is to apply the fertilizer on the surface with a lime sower or a fertilizer drill and plow it under. This fertilizer will thus be distributed from the surface to the depth of the furrow, most of it probably rolling to the bottom of the furrow as it is turned over. Thus, it will be well distributed in the soil in the zone of greatest root activity. This method has given excellent results at Geneva and elsewhere in fertilizing beets, cabbage, sweet corn, and tomatoes.

For those who hesitate to plow under the entire amount of fertilizer, there is another method used extensively by a number of successful growers. This is a combination method in which half the fertilizer is broadcast and plowed under and the remaining half drilled deeply in the final preparation of the land. If this is done *after* the discing and harrowing are completed, this fertilizer will remain in a series of parallel bands 7 inches apart (the interval between drill teeth). This will give the advantages of band application, less rapid "fixation" of the fertilizer, and a quick start, the seedlings not being over 3½ inches away from a fertilizer band. At the same time, on account of the large number of bands, the concentration per band will be reduced so that there will be no danger of "burning" from an excessive concentration of soluble salts. To be most effective, the fertilizer drill should be set just as deep as possible (which will be about 4 inches in most soils). When drilled thus, the fertilizer will be deposited in the zone of greatest root activity. Also, it will be below the cultivator teeth, if cultivating is done correctly, and therefore the root growth which will be stimulated in the fertilizer band will not be torn off by the cultivator and the plant will not suffer from root pruning.

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the number of pounds of raw material for a desired per cent. of plant food in a ton of mixed goods—or find what per cent. of a certain plant food in a ton of fertilizer produced by a specific quantity of raw materials.

No mathematical calculations are necessary. You can find the figures in a few seconds with the aid of

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This list contains representative concerns in the Commercial Fertilizer Industry, Including fertilizer manufacturers, machinery and equipment manufacturers, dealers in and manufacturers of commercial fertilizer materials and supplies, brokers, chemists, etc.
For Alphabetical List of Advertisers, see page 33.

ACID BRICK
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

ACID EGGS
Chemical Construction Corp., New York City.

ACIDULATING UNITS
Chemical Construction Corp., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMO-PHOS
American Cyanamid Co., New York City.

AMMONIA—Anhydrous
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA LIQUOR
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.
Hydrocarbon Products Co., New York City.

AMMONIA OXIDATION UNITS
Chemical Construction Corp., New York City.

AMMONIATING EQUIPMENT
Sackett & Sons Co., The A. J., Baltimore, Md.

AMMONIUM NITRATE SOLUTIONS
Barrett Division, The, Allied Chemical & Dye Corp., New York City.

AUTOMATIC ELEVATOR TAKEUPS
Sackett & Sons Co., The A. J., Baltimore, Md.

BABBITT
Sackett & Sons Co., The A. J., Baltimore, Md.

BAGS AND BAGGING—Manufacturers
Bagpak, Inc., New York City.
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill.
Union Bag & Paper Corporation, New York City.

BAGS—Cotton
Bemis Bro. Bag Co., St. Louis, Mo.
Textile Bag Mfrs. Association, Chicago, Ill.

BAGS—Paper
Bagpak, Inc., New York City
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Union Bag & Paper Corporation, New York City.

BAGS (Waterproof)—Manufacturers
Bemis Bro. Bag Co., St. Louis, Mo.
St. Regis Paper Co., New York City.
Textile Bag Mfrs. Association, Chicago, Ill,
Union Bag & Paper Corporation, New York City.

BAGS—Dealers and Brokers
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

BAG CLOSING MACHINES
Bagpak Inc., New York City.

BAGGING MACHINES—For Filling Sacks
Atlanta Utility Works, East Point, Ga.
Bagpak, Inc., New York City.
Sackett & Sons Co., The A. J., Baltimore, Md.

BAG PILERS
Link-Belt Company, Philadelphia, Chicago.

BEARINGS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

BELT LACING
Sackett & Sons Co., The A. J., Baltimore, Md.

BELTING—Chain
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

BELTING—Leather, Rubber, Canvas
Sackett & Sons Co., The A. J., Baltimore, Md.

BOILERS—Steam
Atlanta Utility Works, East Point, Ga.

BONE BLACK
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Huber & Company, New York City.

BONE PRODUCTS
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BORAX AND BORIC ACID
American Potash and Chem. Corp., New York City.
Pacific Coast Borax Co., New York City.

BROKERS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Dickerson Co., The, Philadelphia, Pa.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Keim, Samuel L., Philadelphia, Pa.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

BUCKETS—Elevator
Link-Belt Company, Philadelphia, Chicago
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

A Classified Index to Advertisers in "The American Fertilizer"

BUYERS' GUIDE

For an Alphabetical List of all the Advertisers, see page 33

BUCKETS—For Hoists, Cranes, etc., Clam Shell, Orange Peel, Drag Line, Special; Electrically Operated and Multi Power
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.

BURNERS—Sulphur
Chemical Construction Corp., New York City.

BURNERS—Oil
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CABLEWAYS
Hayward Company, The, New York City.

CARBONATE OF AMMONIA
American Agricultural Chemical Co., New York City.
DuPont de Nemours & Co., E. I., Wilmington, Del.

CARS—For Moving Materials
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CARTS—Fertilizer, Standard and Roller Bearing
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

CASTINGS—Acid Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.

CASTINGS—Iron and Steel
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CEMENT—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.

CHAIN DRIVES—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAINS AND SPROCKETS
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHAMBERS—Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CHEMICAL APPARATUS
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Duriron Co., Inc., The, Dayton, Ohio.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

CHEMICALS
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
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Huber & Company, New York City.

CHEMICALS—Continued
International Minerals & Chemical Corporation, Chicago, Ill
McIver & Son, Alex. M., Charleston, S. C.
Phosphate Mining Co., The, New York City.
Wellmann, William E., Baltimore, Md.

CHEMICAL PLANT CONSTRUCTION
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CHEMISTS AND ASSAYERS
Gascoyne & Co., Baltimore, Md.
Shuey & Company, Inc., Savannah, Ga.
Stillwell & Gladding, New York City.
Wiley & Company, Baltimore, Md.

CLUTCHES
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

CONCENTRATORS—Sulphuric Acid
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.
Dickerson Co., The, Philadelphia, Pa.
Phosphate Mining Co., The, New York City.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

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Bradley & Baker, New York City.
Huber & Company, New York City
Jett, Joseph C., Norfolk, Va.
McIver & Son, Alex. M., Charleston, S. C.
Schmaltz, Jos. H., Chicago, Ill.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
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Sackett & Sons Co., The A. J., Baltimore, Md.

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American Agricultural Chemical Co., New York City
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Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

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Link-Belt Company, Philadelphia, Chicago.

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Stedman's Foundry and Mach. Works, Aurora, Ind.

ELEVATORS AND CONVEYORS—Portable
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link Belt Speeder Corp., Chicago, Ill., and Cedar Rapids, Iowa.

FERTILIZER MANUFACTURERS
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American Cyanamid Company, New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Company, Columbus, Ohio.
International Minerals and Chemical Corporation, Chicago, Ill.
Phosphate Mining Co., The, New York City.
U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

FISH SCRAP AND OIL
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Bradley & Baker, New York City.
Huber & Company, New York City.
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McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

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Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.

HOPPERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Wellmann, William E., Baltimore, Md.

IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

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American Agricultural Chemical Co., New York City.
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Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
McIver & Son, Alex. M., Charleston, S. C.
Wellmann, William E., Baltimore, Md.

LOADERS—Car and Wagon, for Fertilizers
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Chemical Construction Corp., New York City.
Duriron Co., Inc., The, Dayton, Ohio.
Fairlie, Andrew M., Atlanta, Ga.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
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MACHINERY—Elevating and Conveying
Atlanta Utility Works, East Point, Ga.
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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Ashcraft-Wilkinson Co., Atlanta, Ga.
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Barrett Division, The, Allied Chemical & Dye Corp., New York City.
Bradley & Baker, New York City.
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Schmaltz, Jos. H., Chicago, Ill.
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NITRATE OVENS AND APPARATUS
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NOZZLES—Spray
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PACKING—For Acid Towers
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PIPE—Acid Resisting
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Fairlie, Andrew M., Atlanta, Ga.
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POTASH SALTS—Dealers and Brokers
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Minerals & Chemical Corporation, Chicago, Ill
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Potash Co. of America, New York City.
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Monarch Mfg. Works, Inc., Philadelphia, Pa.

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Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., New York City.
Wellmann, William E., Baltimore, Md.

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See Catalog 6-C

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